Instructions: Try these problems from the textbook as practice (answers below).

Problems

2-6. Use Stokes' Theorem to evaluate $\iint_S \text{curl}(\mathbf{F}) \cdot d\mathbf{S}$.

3. $\mathbf{F}(x, y, z) = \langle ze^y, x \cos y, xz \sin y \rangle$, S is the hemisphere $x^2 + y^2 + z^2 = 16,\ y \geq 0$, oriented in the direction of the positive y-axis
5. $\mathbf{F}(x, y, z) = \langle xyz, xy, x^2yz \rangle$, S consists of the top and the fours sides (but not the bottom) of the cube with vertices $(\pm 1, \pm 1, \pm 1)$, oriented outward

7-14. Use Stokes' Theorem to evaluate $\int_c \mathbf{F} \cdot d\mathbf{r}$. In each case C is oriented counterclockwise as viewed from above.

7. $\mathbf{F}(x, y, z) = \langle x + y^2, y + z^2, z + x^2 \rangle$, C is the triangle with vertices $(1, 0, 0),\ (0, 1, 0),\ (0, 0, 1)$
9. $\mathbf{F}(x, y, z) = \langle xy, yz, xz \rangle$, C is the boundary of the part of the paraboloid $z = 1 - x^2 - y^2$ in the first octant
11. $\mathbf{F}(x, y, z) = \langle -yx^2, xy^2, e^{xy} \rangle$, C is the circle in the xy-plane of radius 2 centered at the origin

17-19. Verify that Stokes' Theorem is true for the given vector field $\mathbf{F}$ and surface S.

17. $\mathbf{F}(x, y, z) = \langle -y, x, -2 \rangle$, S is the cone $z^2 = x^2 + y^2,\ 0 \leq z \leq 4$, oriented downward
19. $\mathbf{F}(x, y, z) = \langle y, z, x \rangle$, S is the hemisphere $x^2 + y^2 + z^2 = 1,\ y \geq 0$, oriented in the direction of the positive y-axis

Answers

3. 16π
5. 0
7. -1
9. $-\dfrac{17}{20}$
11. 8π
17. -32π
19. $-\pi$